

Form ESA-B4. Final Public Report for ESA-148-2

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| Company | General Motors (ESA-148-2) | ESA Dates | October 16-18, 2007 |
| Plant | Wilmington Assembly | ESA Type | Steam System |
| Product | Automobiles | ESA Specialist | Richard J. Jendrucko, Ph.D. |

| ENERGY SAVINGS OPPORTUNITY SUMMARY INFORMATION | | | | |
|--|------------|---|--------------------------------|-------|
| Identified Opportunity | Savings/yr | | | |
| | kWh | MMBtu | Fuel Type | N,M,L |
| I. Reduce steam demand; Reduce plant air infiltration | 0 | 18,600 (incl. direct-fired units) 176,000 | Natural Gas Fuel oil #6 | M |
| II. Reduce steam demand; Upgrade boiler controls | 0 | 16,700 | Natural Gas | N |
| III. Improved insulation; Apply insulation to bare steam piping- | 0 | 11,500 | Natural gas | M |
| IV. Steam trap maintenance program; Employ outside vendor to survey all traps and repair all defective units | 0 | 6,600 | Natural gas | M |

1. Objective of ESA:

The objective of this ESA was twofold:

- a) To train company/plant personnel in the use of the DOE Steam Tool software.
- b) To perform a "training assessment" of plant equipment and processes leading to the recommendation of measures for achieving substantial plant energy savings.

2. Focus for Assessment:

The ESA focused on the reduction of steam, natural gas and electricity consumption and cost in the plant. While the primary focus was steam systems, the plant assessment lead related that there is substantial natural gas, fuel oil and electricity consumed in plant systems and attention was directed to these systems as well.

Special attention was directed to measures leading to the improvement in steam generation efficiency and heat recovery from fired equipment.

3. Approach for ESA:

The ESA Specialist worked directly and continuously on-site with the Plant Lead, and intermittently with the Utilities Manager. Other plant personnel supplied plant data and answers to specific questions as the assessment proceeded. After a period of general discussion and data assimilation, the manufacturing plant areas were toured. Following the tour, further discussion clarified the major areas of steam, natural gas and electricity use, and a list of prospective steam energy-savings measures was developed. The ESA Expert then introduced the use of the SSAT tool which was used to analyze selected high-priority projects. Project screening included consideration of SSAT energy saving projections and manually-calculated savings (for measures which could not be analyzed with SSAT), technical feasibility and estimated payback period. Based on screening results, the following energy-saving measures were recommended.

DOE Steam System Assessment Tool (SSST) Results:

Steam system profiling: 48/90 pts. = 53%

Steam system operating practices: 55/140 pts. = 39%

Boiler plant operating practices: 33/80 pts. = 41%

Distribution, end use, recovery and operating practices: 20/30 pts. = 63%

Overall score: 156/340 pts. = 46%

The SSST results largely reflect the age and diversity of plant energy systems and indicate substantial opportunity for energy savings in steam systems.

4. Energy Saving Opportunities:

The savings projections for the recommended energy-saving measures listed in the summary table above (and discussed below) should be considered approximate, with accuracy subject to the limitations of the plant data available for analysis at the time of the ESA. Furthermore, due to the complexity of the plants steam and other energy systems, there may be interactions resulting from implementing more than one of the recommendations. Therefore, further analysis should be done to validate the technical feasibility and savings projections for recommended measures before implementation.

I. Reduce steam demand; Reduce building air infiltration rates:

A substantial amount of fossil fuel energy (a fraction of natural gas and all #6 fuel oil) is consumed during winter months in space-heating equipment including steam-coil heated and direct-fired gas heating units. Air infiltration commonly accounts for 25% or more of space heating loads in industrial facilities. During the plant inspection it was noted that there are numerous openings in the extensive building envelope including numerous personnel and loading doorways and gaps where piping and ductwork enters and leaves plant buildings. Overhead doors and not always closed after use resulting in substantial unnecessary heating loads. It is recommended to thoroughly seal all potential openings (e.g. door and window frames) and to use automatic systems to close overhead doors when not in use. (**Medium-term opportunity**; potential natural gas energy savings: 3.0%; potential fuel oil savings: 10%)

II. Reduce steam demand: Upgrade boiler controls:

The four (among 5) utilized boilers are of ages 47 years (one unit) and 60 years (three units). Although there have been boiler control upgrades over the years, the operated boilers are controlled primarily in a manual process for load balancing and to avoid overloading. Due to the advanced age of the boilers, individual boiler loads are typically low, ranging down to 25% of rated capacity thereby limiting achievable efficiencies. It is recommended to upgrade the control system to optimize steam generation efficiency on an automatic, continuous basis for load allocation and combustion air control. (**Short-term opportunity**; potential natural gas savings: 3.6%)

III. Improve insulation; Apply insulation to bare steam piping:

During the assessment it was revealed that there is a substantial amount of uninsulated steam distribution piping due to age degradation and uncompleted maintenance activities. It is recommended to thoroughly survey all steam distribution piping and to apply new insulation to any surfaces found to be uninsulated. (**Medium-term opportunity**; potential natural gas energy savings: 2.8%)

IV. Implement steam trap maintenance program; Employ outside vendor to survey all traps and to repair all defective units:

Industrial data demonstrates that trap failures occur on a continuing basis as a system ages and it is likely that there are numerous failed blowing traps. In order to achieve rapid results with an excellent payback, it is recommended to contract with an outside steam trap vendor to inventory and inspect all traps, and to repair failed units. (**Short-term opportunity**; potential natural gas energy savings: 1.0%)

Summary of potential savings:

Near-term measures: $17,280 \times 10^6$ Btu/yr.

Medium-term measures: $57,664 \times 10^6$ Btu/yr.

Management and UAW Support and Comments:

A corporate level management team and the UAW/WFG Joint Task Team encourage any effort that reduces the Energy usage at all of its plants located around the country. General Motors has a target to reduce energy use and costs by 6% this year. They have an Energy Engineer with this assignment at each facility.

Company and plant managers arranged for the Plant Lead to work continuously with the ESA Expert over a three-day period to clarify plant operations and concerns, to be trained in SSAT use and to assist in the formulation of energy-saving measures. The plant Utilities Manager provided much essential steam system information. Plant management and engineering service personnel were very supportive of the ESA and rated the value of the SSAT tool and overall assessment as substantially useful in guiding energy conservation and associated cost reduction actions

The UAW/WFG Joint Task Teams have identified several Department of Energy (DOE) best practices that will have a significant impact if implemented at GM Facilities. Due to the focus of the Best Practices there is an opportunity for our UAW Skilled Trades to provide a substantial cost savings impact to the operating costs of our facilities by working jointly with the GM/WFG management organization.

UAW/WFG Joint Task Team, DOE associated Best Practices:

BMES-01 Pumping System Assessment Tool

BMES-02 Air Master + Diagnostic Tool

BMES-03 Motor Master + Diagnostic Tool

BMES-04 Steam System Assessment Tool

BMES-07 Fan system Assessment Tool

BMES-09 Chilled Water System Assessment Tool

The UAW Skilled Trades working in conjunction with the GM/WFG Energy & Utilities Services Group (EUSG) and the GM/WFG Facilities Management Group (FM) can jointly pursue the effort to optimize the operating efficiencies of these major systems that are found in GM facilities.

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